

Commercial Motor Vehicle Direct Observation of Safety Belt Use

Final Report

**Prepared for:
Office of Highway Safety Planning
4000 Collins Road
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**Prepared by:
Wayne State University
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The opinions, findings, and conclusions expressed in this publication are those of the author(s) and not necessarily those of the Michigan Office of Highway Safety Planning, the U.S. Department of Transportation, or the National Highway Transportation Safety Administration. This report was prepared in cooperation with the Michigan Office of Highway Safety Planning and the U.S. Department of Transportation, and the National Highway Traffic Safety Administration.

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle Commercial Motor Vehicle Direct Observation of Safety Belt Use		5. Report Date September 2006	
		6. Performing Organization Code	
7. Author(s) Tapan K. Datta and Deborah S. McAvoy		8. Performing Organization Report No.	
9. Performing Organization Name and Address Wayne State University-Transportation Research Group Department of Civil and Environmental Engineering 5451 Cass Avenue, #208, Schaver Building Detroit, MI 48202		10. Work Unit No. (TRAIS)	
		11. Contract or Grant No.	
12. Sponsoring Agency Name and Address Office of Highway Safety Planning 4000 Collins Road Lansing, MI 48909		13. Type of Report and Period Covered Final Report	
		14. Sponsoring Agency Code	
15. Supplementary Notes			
16. Abstract This study reports the results of the commercial motor vehicle safety belt usage observational surveys in 2006. As a part of this statewide survey, 181 sites were surveyed including limited access highway sites and major signalized intersections. All drivers and front-seat passengers were observed for safety belt use and non-use. Each observation was categorized by vehicle type, vehicle range, cargo type, fleet owner, gender, age and race of the driver. The weighted overall safety belt usage rate for drivers and passengers of commercial motor vehicles was found to be 73.9 percent. This usage rate is approximately 25.4 percent higher than the national average. Although the commercial motor vehicle safety belt usage rate continues to trail the passenger vehicle safety belt use rate, future targeted programs, similar to the "Click It or Ticket" campaign, should increase safety belt usage rates for commercial motor vehicle drivers and passengers.			
17. Key Words Commercial motor vehicle safety, safety belt usage		18. Distribution Statement Unlimited	
19. Security Classification (report) Unclassified	20. Security Classification (Page) Unclassified	21. No of Pages 34	22. Price

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1.0 INTRODUCTION

Increasing the use of safety restraint systems, while driving or traveling as a passenger in an automobile, is one of the most effective ways of reducing injuries and fatalities on the nation's highways; yet, more than fifty percent of the drivers of commercial motor vehicles continue to ignore laws and safety precautions and drive or ride unbuckled in the USA. A nation-wide observational study conducted by the United States Department of Transportation (USDOT) and the Federal Motor Carrier Safety Administration (FMCSA) encompassing 3,909 commercial motor vehicles demonstrated that the overall safety belt usage rate among drivers of commercial motor vehicles was 48 percent [1]. The State of Michigan was not one of the 12 states included in this study conducted in the year 2003. Although, in the State of Michigan, informal small-scale studies to determine the safety belt usage rate among drivers of commercial motor vehicles have yielded similar results.

Past safety belt usage studies for passenger vehicles indicate that the overall use by drivers and front seat passengers has been steadily increasing in the State of Michigan from 81.9 percent in 2000 to 92.9 percent in 2005. It may be noted that this rate of safety belt usage in Michigan is also far ahead of the national average of 82 percent. While a considerably high proportion of motorists of passenger vehicles buckle up as a safety precaution, the usage rate is relative low among drivers of commercial motor vehicles. It is important to note that Michigan is a "primary law" state since the year 2000, which means a motorist can be stopped and cited for the sole reason of not wearing a safety belt. Although Michigan practices a zero-tolerance for safety belt usage policy, a high number of citations were issued to drivers of commercial motor vehicles in the first half of the year 2005.

Approximately 5,000 motorists are killed every year in traffic crashes that involve commercial motor vehicles in the USA. Although, less than 20 percent of the fatalities of these crashes are occupants of commercial motor vehicles, approximately 80 percent of the truck drivers involved in such crashes are killed after being thrown-off of their seats, due to the non-use of safety restraint systems. This statistic reveals that it is absolutely essential that the drivers of the commercial motor vehicles to restrain themselves with safety belts.

The use of safety belts is the single most effective means of reducing fatal and non-fatal injuries in vehicular crashes. This holds true for commercial motor vehicles as well. The National Highway Traffic Safety Administration (NHTSA) estimates that 147,000 lives have been saved between 1975 and 2001 due to the use of safety belts. They also estimate that the non-use of safety belts causing fatalities and severe injuries result in an overall societal cost of 26 billion dollars in the USA annually.

Currently, airbag systems are a part of standard equipment in all vehicles. The occupants need to be restrained by safety belts for the airbags to be effective in saving lives in the event of a severe crash. Safety belts protect vehicle occupants in the following ways: reduces the chance of contact with vehicle interiors, prevents the occupants from ejection, and prevents occupants from being too close to the deployed airbags, thus avoiding severe injuries from the airbags and ejection from the vehicles.

Past studies indicate that the use of safety belts reduce the risk of fatal, as well as moderate to critical injuries, for the driver and the front seat passengers. Therefore, a small increase in safety belt use often results in significant savings in human lives and misery to the society. The non-use of safety belts is a behavioral issue and, therefore, programs targeted to change driver behavior related to the use of safety belts often leaves a lasting impact on the drivers and thus, continues to increase the safety belt use rate in the driving population.

Keeping in mind the low safety belt usage rate among drivers of commercial motor vehicles, the Office of Highway Safety Planning (OHSP) in association with the Michigan State Police (MSP/MCD), USDOT/FMCSA Michigan division office and Michigan Center for Truck Safety, are developing a “Commercial Motor Vehicle Safety Belt Action Plan”. The major objective of this plan will be to promote the use of safety belts among drivers of commercial motor vehicles. The plan will include several educational and enforcement elements. It is essential to know the current safety belt usage rate among drivers of commercial motor vehicles in Michigan to develop future safety programs. This baseline data will be compared with the safety belt usage rates observed in the future, as a performance measure, after the educational and enforcement programs have been implemented.

1.1 Study Purpose and Objectives

The purpose of this statewide study was to perform observational surveys for 202 intersections, freeway exit or entrance ramps, truck parking lots, truck stops and rest areas to determine the percentage of drivers and front-seat passengers in commercial motor vehicles utilizing their safety belts.

The specific objectives of this project were as follows:

1. Develop a probability-based methodology for collecting data for a representative sample of locations throughout the State, which will ensure reliable statewide statistics, in an economically feasible manner.
2. Provide training to all staff conducting the direct observation surveys and conduct Quality Assurance/Quality Control (QA/QC) of the data collection efforts.
3. Conduct direct observation surveys and record data regarding seat belt use, non-use or misuse by the drivers of commercial motor vehicles along with other relevant factors.
4. Summarize and cross-tabulate the observational data in a spreadsheet format and analyze the data indicating overall safety belt use, safety belt use by stratum, safety belt use by type of commercial motor vehicle, safety belt use by time of day and day of week, and safety belt use by gender, age and other demographic characteristics (ethnicity, etc.).
5. Calculate the current overall safety belt usage as a percentage among drivers of commercial motor vehicles, which will be used as the baseline data for the State of Michigan. The Michigan's commercial motor vehicle drivers safety belt usage rate will be compared with the available national usage data. The safety belt usage as a percentage will also be calculated for each geographic location, type of vehicle, age, gender and ethnicity of driver.

1.2 Study Area

The study area for the statewide observational survey included the counties that represented at least 85 percent of the population in the State of Michigan, as well as ten counties recording the highest frequency of commercial motor vehicle crashes based on 2003 crash data obtained from the statewide crash database.

2.0 METHODOLOGY

The use of seat belts among drivers and front seat passengers of commercial motor vehicles is currently estimated at 48 percent nationally based upon the study conducted by the FMCSA [1]. The use rate is expected to be higher in the State of Michigan, since Michigan is a primary law state. In comparison, the use of safety belts among drivers and front seat occupants of passenger vehicles has been steadily increasing over the past five years. In 2004, the goal of a 90 percent safety belt use rate for passenger vehicles was achieved in the State of Michigan.

In order to develop targeted awareness programs to increase safety belt use among drivers of commercial motor vehicles, one must know the distribution of use rates in various parts of the state and among various demographic groups, in addition to knowing the overall safety belt use rate in the state. It is, however, important to capture the statewide use rate following the sampling strategy and data collection procedure recommended by NHTSA. NHTSA recommends uniform criteria for observational surveys of seat belt use by drivers and front seat occupants of passenger vehicles, a similar procedure may be used for commercial motor vehicles. The methodologies used in the direct observation surveys of safety belt use/non-use, in the State of Michigan, for the years 2000 to 2004 were examined to evaluate their appropriateness in regard to statistical significance, addressing the needs of OHSP and the State of Michigan, and following the uniform criteria as presented in the Federal Register and NHTSA documents. The methodology for the selection of the 202 sites in the State of Michigan to encompass 85 percent of the population is described as follows:

- A 32-county statewide sample selected for this survey represents 86.86 percent of the state's population based upon 2004 U.S. Bureau of Census Data estimates as shown in Table 1, and fulfills NHTSA's requirements.

Table 1. U.S. Census Bureau 2004 Census Data for Michigan by County

State of Michigan Total Population

10,112,620

Name of County	Percent Population Statewide for Michigan		Cumulative Percent Population Statewide for Michigan	County Ranking by Population	County Included in Study
Wayne County	2,016,202	19.94%	19.94%	1	Yes
Oakland County	1,213,339	12.00%	31.94%	2	Yes
Macomb County	822,660	8.13%	40.07%	3	Yes
Kent County	593,898	5.87%	45.94%	4	Yes
Genesee County	443,947	4.39%	50.33%	5	Yes
Washtenaw County	339,191	3.35%	53.69%	6	Yes
Ingham County	280,073	2.77%	56.46%	7	Yes
Ottawa County	252,351	2.50%	58.95%	8	Yes
Kalamazoo County	240,724	2.38%	61.33%	9	Yes
Saginaw County	209,062	2.07%	63.40%	10	Yes
Livingston County	177,538	1.76%	65.16%	11	Yes
Muskegon County	174,401	1.72%	66.88%	12	Yes
St. Clair County	170,916	1.69%	68.57%	13	Yes
Berrien County	163,125	1.61%	70.18%	14	Yes
Jackson County	162,973	1.61%	71.80%	15	Yes
Monroe County	152,552	1.51%	73.30%	16	Yes
Calhoun County	139,067	1.38%	74.68%	17	Yes
Allegan County	112,477	1.11%	75.79%	18	Yes
Bay County	109,480	1.08%	76.87%	19	Yes
Eaton County	107,056	1.06%	77.93%	20	Yes
Lenawee County	101,768	1.01%	78.94%	21	Yes
Lapeer County	92,510	0.91%	79.85%	22	Yes
Midland County	84,615	0.84%	80.69%	23	Yes
Grand Traverse County	82,752	0.82%	81.51%	24	Yes
Van Buren County	78,541	0.78%	82.29%	25	Yes
Shiawassee County	73,125	0.72%	83.01%	26	Yes
Clinton County	68,800	0.68%	83.69%	27	Yes
Marquette County	64,874	0.64%	84.33%	28	Yes
Isabella County	64,481	0.64%	84.97%	29	Yes
Ionia County	64,378	0.64%	85.60%	30	Yes
Montcalm County	63,627	0.63%	86.23%	31	Yes
St. Joseph County	62,964	0.62%	86.86%	32	Yes

- In addition, ten counties were selected for inclusion in the statewide sample that represented the highest frequency of commercial motor vehicle crashes in the state based on 2003 crash data. These counties are as follows and were also represented in the 32-county statewide sample:
 - Wayne County, Oakland County, Macomb County, Kent County, Washtenaw County, Genesee County, Kalamazoo County, Berrien County, Ingham County and Monroe County.

- At the request of OHSP, three counties were added to the statewide sample representing commercial motor vehicle travel across Michigan's Upper Peninsula. The counties that were selected in the Upper Peninsula include Delta County, Mackinac County and Schoolcraft County.

- The counties included in the 35-county statewide survey are listed below and depicted in Figure 1.

- | | |
|-------------------|-----------------|
| 1. Allegan | 18. Macomb |
| 2. Bay | 19. Marquette |
| 3. Berrien | 20. Midland |
| 4. Calhoun | 21. Monroe |
| 5. Clinton | 22. Montcalm |
| 6. Eaton | 23. Muskegon |
| 7. Genesee | 24. Oakland |
| 8. Grand Traverse | 25. Ottawa |
| 9. Ingham | 26. Saginaw |
| 10. Ionia | 27. St. Clair |
| 11. Isabella | 28. St. Joseph |
| 12. Jackson | 29. Shiawassee |
| 13. Kalamazoo | 30. Van Buren |
| 14. Kent | 31. Washtenaw |
| 15. Lapeer | 32. Wayne |
| 16. Lenawee | 33. Delta |
| 17. Livingston | 34. Schoolcraft |
| | 35. Mackinac |

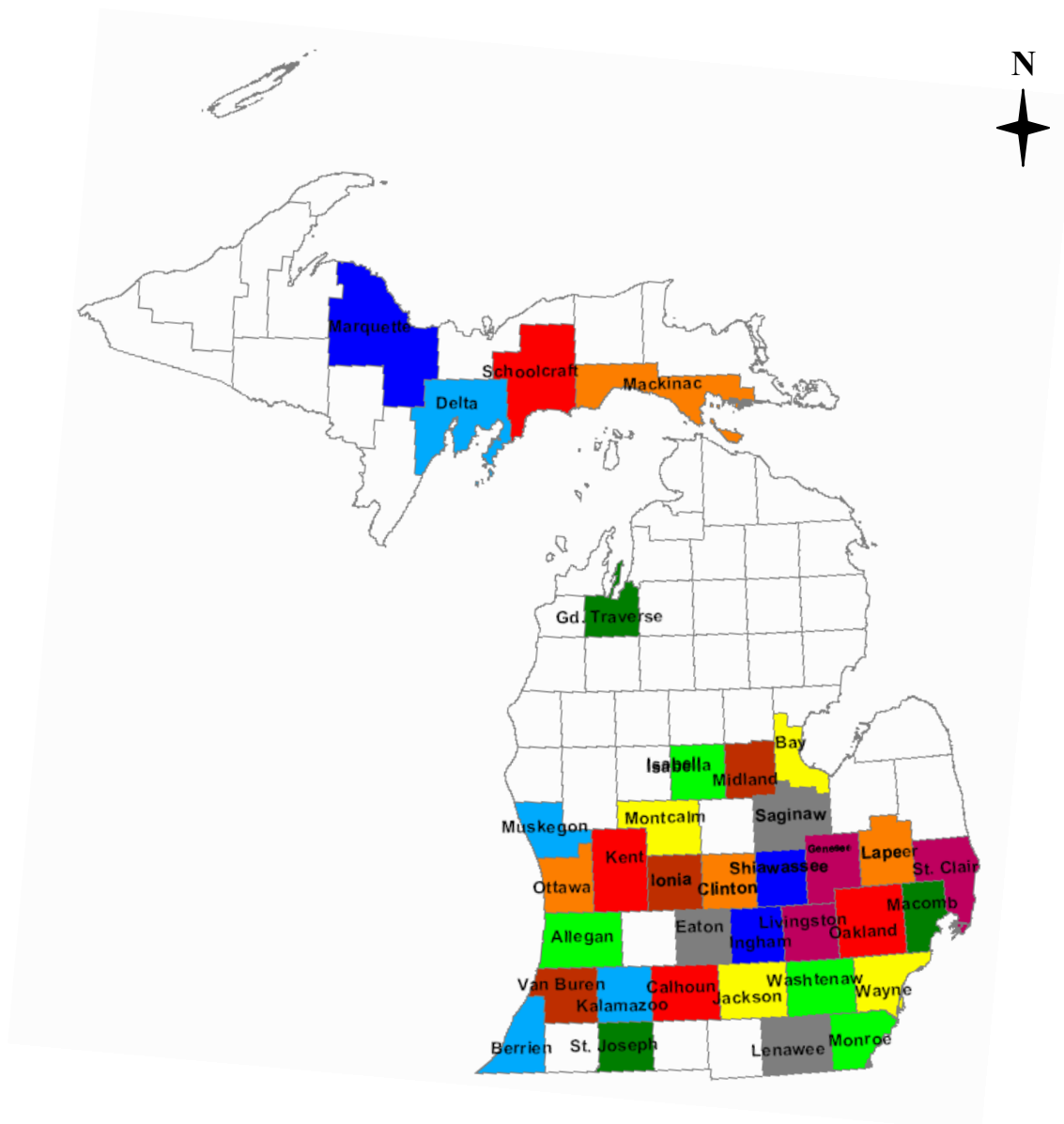


Figure 1. 35-County Sample for the Direct Observation Safety Belt Surveys

- A system for partitioning the candidate counties into various strata, based upon safety belt use rate, vehicle miles traveled, and commercial vehicle miles traveled was developed. In the 2004 direct observation safety belt study, the 2004 vehicle miles traveled were utilized to assist in the partitioning into various strata; however, this does not represent the miles traveled by commercial vehicles alone. Therefore, the

estimated commercial vehicle miles travel data were utilized in this study. Data for the vehicles miles traveled and the commercial motor vehicle miles traveled were obtained from the Michigan Department of Transportation for the year of 2001. However, for the year 2004, only motor vehicle travel data was available. To estimate the 2004 commercial motor vehicle miles traveled, the percentage of increase in passenger vehicle miles travel data between 2001 and 2004 was used to estimate the 2004 commercial motor vehicle travel data as shown in Table 2. The number of observation sites for each stratum, except the three counties added to represent Michigan's Upper Peninsula, was based upon the percentage of commercial vehicle miles traveled by stratum as shown in Table 3. Fifty (50) sites were selected for observation from Stratum 1, 51 sites from Stratum 2, 63 sites from Stratum 3 and 28 sites from Stratum 4. Ten (10) sites were selected from the counties representing Michigan's Upper Peninsula; Delta County, Mackinac County and Schoolcraft County. A complete listing of the 202 sites is provided in Appendix I.

Table 2. Calculation of 2004 Commercial Motor Vehicle Miles Traveled (CMVMT)

Region & County	VMT (2001) (MDOT)	CMVMT (2001) (MDOT)	Calc. CMVMT % of Total VMT	VMT (2004) (MDOT)	% Increase in VMT (2001 to 2004)	Est. CMVMT (2004)
Superior Region	2,153,000,000	225,700,000	10.48%			
Delta	394,561,000	41,362,015		421,928,000	2.26%	42,297,018
Mackinac	289,689,000	30,368,234		292,663,000	0.34%	30,471,802
Schoolcraft	145,671,000	15,270,759		161,368,000	3.47%	15,800,666
Marquette	590,981,000	61,952,815		629,897,000	2.15%	63,283,874
North Region	3,948,000,000	354,700,000	8.98%			
Grand Traverse	741,933,000	66,657,456		806,758,000	2.83%	68,544,866
Grand Region	5,551,000,000	507,500,000	9.14%			
Muskegon	1,303,533,000	119,175,463		1,447,105,000	3.54%	123,399,345
Ottawa	1,899,715,000	173,681,384		2,077,284,000	3.02%	178,932,438
Kent	5,263,788,000	481,241,652		5,773,450,000	3.13%	496,297,646
Montcalm	580,838,000	53,103,096		589,027,000	0.47%	53,351,492
Ionia	664,754,000	60,775,113		714,959,000	2.46%	62,268,132

Table 2. Calculation of 2004 Commercial Motor Vehicle Miles Traveled (Continued)

Region & County	VMT (2001) (MDOT)	CMVMT (MDOT est. 2001)	Calc. CMVMT % of Total VMT	VMT (2004) (MDOT)	% Increase in VMT (2001 to 2004)	Est. CMVMT (2004)
Bay Region	6,682,000,000	569,600,000	8.52%			
Isabella	554,951,000	47,306,209		587,432,000	1.91%	48,211,703
Midland	764,978,000	65,209,738		827,006,000	2.63%	66,926,641
Bay	1,305,638,000	111,297,726		1,325,042,000	0.49%	111,846,375
Saginaw	2,175,968,000	185,488,083		2,259,369,000	1.26%	187,828,245
Genesee	4,562,822,000	388,952,920		4,731,531,000	1.22%	393,688,828
Lapeer	873,486,000	74,459,387		892,081,000	0.70%	74,984,052
Southwest Region	5,690,000,000	1,033,100,000	18.16%			
Allegan	1,186,212,000	215,373,571		1,234,491,000	1.34%	218,256,714
Van Buren	922,234,000	167,444,630		1,000,428,000	2.75%	172,049,254
Kalamazoo	2,447,532,000	444,384,061		2,603,446,000	2.08%	453,626,627
Calhoun	1,684,440,000	305,833,913		1,731,659,000	0.93%	308,665,377
Berrien	1,973,802,000	358,371,678		2,180,694,000	3.38%	370,479,397
St. Joseph	577,718,000	104,892,876		597,553,000	1.13%	106,079,836
University Region	9,390,000,000	1,292,000,000	13.76%			
Clinton	1,084,633,000	149,238,108		1,140,428,000	1.69%	151,754,445
Shiawassee	742,873,000	102,214,262		779,541,000	1.62%	103,869,082
Eaton	1,114,260,000	153,314,581		1,189,516,000	2.20%	156,691,238
Ingham	2,439,942,000	335,719,389		2,589,095,000	2.00%	342,425,358
Livingston	1,818,958,000	250,276,223		1,954,324,000	2.42%	256,336,760
Jackson	1,659,759,000	228,371,526		1,723,634,000	1.27%	231,264,316
Washtenaw	3,482,767,000	479,205,001		3,742,005,000	2.42%	490,811,417
Lenawee	868,301,000	119,472,299		898,211,000	1.14%	120,828,647
Monroe	1,843,896,000	253,707,522		2,143,438,000	5.15%	266,762,541
Metro Region	18,101,000,000	1,191,400,000	6.58%			
Wayne	17,901,746,000	1,178,285,188		18,575,126,000	1.24%	1,192,877,583
Oakland	12,489,382,000	822,045,728		13,113,695,000	1.64%	835,520,967
Macomb	6,192,499,000	407,587,609		6,527,891,000	1.77%	414,817,072
St. Clair	1,574,250,000	103,616,455		1,624,723,000	1.06%	104,712,197

Table 3. Commercial Motor Vehicles Miles by Stratum

Stratum & County	Est. CMVMT (2004)	Total CMVMT by Stratum	% of Total CMVMT	Number of Sites in Stratum	Type of Sites
Stratum 1					
Ingham	342,425,358				Freeways 35 Intersections 15
Kalamazoo	453,626,627				
Oakland	835,520,967				
Washtenaw	490,811,417				
Total Stratum 1 VMT		2,122,384,369	25.80%	50	
Stratum 2					
Allegan	218,256,714				Freeways 36 Intersections 15
Bay	111,846,375				
Eaton	156,691,238				
Grand Traverse	68,544,866				
Jackson	231,264,316				
Kent	496,297,646				
Livingston	256,336,760				
Macomb	414,817,072				
Midland	66,926,641				
Ottawa	178,932,438				
Total Stratum 2 VMT		2,199,914,066	26.74%	51	
Stratum 3					
Berrien	370,479,397				Freeways 44 Intersections 19
Calhoun	308,665,377				
Clinton	151,754,445				
Genesee	393,688,828				
Ionia	62,268,132				
Isabella	48,211,703				
Lapeer	74,984,052				
Lenawee	120,828,647				
Marquette	63,283,874				
Monroe	266,762,541				
Montcalm	53,351,492				
Muskegon	123,399,345				
Saginaw	187,828,245				
Shiawassee	103,869,082				
St. Clair	104,712,197				
St. Joseph	106,079,836				
Van Buren	172,049,254				
Total Stratum 3 VMT		2,712,216,445	32.97%	63	

Table 3. Commercial Motor Vehicles Miles by Stratum (Continued)

Stratum & County	Est. CMVMT (2004)	Total CMVMT by Stratum	% of Total CMVMT	Number of Sites in Stratum	Type of Sites
Stratum 4					Freeways 20 Intersections 8
Wayne	1,192,877,583				
Total Stratum 4 VMT		1,192,877,583	14.50%	28	
Stratum 5					Freeways 7 Intersections 3
Delta	42,297,018				
Mackinac	30,471,802				
Schoolcraft	15,800,666				
Total Stratum 5 VMT		88,569,486		10	
Total Strata VMT		8,227,392,464	NIC Stratum 5		

- The sites selected for this observational study included truck stops, truck parking areas, rest areas, entrance and exit ramps of limited access highways and major signal controlled intersections of the designated truck routes. Weigh stations along highways were avoided because driver behavior may differ due to the presence of police at these locations. The distribution of the sites among those along limited access highways and those at major signal controlled intersections was determined based upon the percentage of commercial travel occurring on the state trunkline system in the State of Michigan of 70 percent. Therefore, seventy percent of the sites selected were comprised of state routes, U.S. national highways and interstate highways; whereas, the remaining 30 percent of the sites were at signal controlled intersections. An equal distribution was selected among the sites along limited access highways wherever possible. A complete listing of all the sites in the state, meeting the above criteria, was assembled and then the sites were chosen in a random manner using a method that ensured an equal probability for each possible observation site in each county of every stratum being selected as a candidate location. Specifically, the sites were numbered sequentially. Random numbers were selected between one and the number of sites to determine which sites would be considered as candidate locations.

- Upon determination of the sites, the direction of traffic flow, day of the week and time of day at each observation site were also determined, prior to conducting the direct observation survey, a similar random method was used ensuring equal probability.
- It was anticipated that a minimum of 5 commercial motor vehicles at signalized intersections and a minimum of 10 commercial motor vehicles at all other locations, which pass the study site, would be observed during a 50-minute survey period at each direct observation survey site. It is anticipated that, for this project, there will be a minimum of 202 individual observation sites. The data collected for the 202 statewide observation sites should provide an accurate representation for each day of the week and each hour of the day during the daylight hours for the safety belt use characteristics of the state.
- A 5-minute traffic count of commercial motor vehicles was conducted prior to the observations being collected, as well as after the observations were completed, to form a basis for estimating the number of such vehicles passing the direct observation site per unit time. Since the target number of commercial motor vehicles at each observation site are 5 vehicles for signalized intersections and 10 vehicles for all other locations, all of the commercial motor vehicles passing the observer at each site may not be observed and the traffic count data will introduce a weighting factor for each study site. However, due to the extremely low volume of commercial vehicles present at each site, data for all of the commercial motor vehicles passing each observer was collected; therefore, a weighting factor is not required.
- As a back up action plan, apart from the primary set of direct observation survey sites, two other sets (viz. a secondary and a tertiary set) of possible locations were determined in a similar random manner prior to conducting the observational survey. When the field observers faced difficulty in observing commercial motor vehicles at the sites selected as primary sites due to traffic, weather and various other adverse

conditions, the field observers were relocated to alternative locations for observations. However, due to the extremely low volume of commercial motor vehicles, only 181 of the proposed 202 sites contained commercial motor vehicle traffic. After visiting the primary, secondary and tertiary sites, the observers did not encounter the presence of any commercial motor vehicles at 21 of the 202 selected sites.

- In order to minimize the travel time and distance required to conduct this study, the observation sites were clustered into geographic regions upon final selection without compromising the randomness of the data.

3.0 OBSERVER TRAINING

Several staff members from the WSU-TRG participated in the data collection for this project. Each of these staff members has or is pursuing an engineering degree and has been trained in general traffic data collection methods and procedures. For this project, each data collector received specific training comprised of technical assistance and field data collection. Based upon the training on commercial motor vehicle safety belt observations and the amount of data required to be collected for each vehicle, it was decided to pair individuals together for data collection. One field observer would collect data on commercial motor vehicles and the second would collect data on drivers and passengers.

Based on the modified data collection efforts, each member of the data collection team participated in a reliability and repeatability study to reach a 95 percent or greater level of reliability and repeatability in their field data collection tests prior to being deployed in the field. The repeatability of a measurement depends on the within-subject standard deviation, which can be calculated using a sample of closely repeated measurements. The repeatability coefficient is simply the within-subject standard deviation adjusted by a probability-based factor and is an estimate of the maximum difference likely to occur between two successive measurements on the same subjects. Reliability concerns the extent to which repeated measurements, by the same method on the same subject, produce the same result.

The reliability and repeatability study was performed at one of the selected sample intersections for this project, Woodward Avenue and Warren Avenue, near the WSU campus. This intersection represents a typical major signalized intersection representing a designated state truck route that could be challenging for observational data collection. For two hours per day, over five days, two observers were randomly paired and assigned to collect safety belt use and non-use data and commercial motor vehicle observational data for one direction of traffic flow at the selected intersection. Although the observers were observing the same traffic flow direction, they did not interact; however, they were able to observe the same vehicles due to the low volume of commercial vehicular traffic.

The data was then summarized for each paired individual to determine the accuracy of their observations. Safety belt use, gender, age, race and commercial motor vehicle characteristics were compared for accuracies between the observers. This exercise was performed the week prior to field data collection.

Upon completion of training for the data collection team, each member of the team received a training manual comprised of the information received during the training session, the schedule of data collection and all necessary field supplies.

Two field supervisors monitored the performance of the field observers. In order to establish a baseline reference of ‘expected’ safety belt use rates, preliminary observation data from previous studies was obtained for each stratum. The field data collectors submitted their observation data on a daily basis and it was immediately entered and compiled on spreadsheets at the WSU campus office. Comparisons were then made between the observed rates and the ‘expected’ safety belt use rates based upon the national safety belt usage rate for commercial motor vehicles of 48 percent, in order to identify any unexpected deviations in the data. Deviations were found to be substantially different than anticipated; however, deviations in the safety belt usage rates among data collectors were not found to be substantially different.

4.0 DATA COLLECTION

Data collection for the commercial motor vehicle safety belt observations occurred between March 6 and April 15, 2006. The driver and passenger of each vehicle were observed for safety belt use and non-use. Both the driver and passenger were separately identified based upon their gender, estimated age and race.

The majority of commercial motor vehicles use the 3-point safety belt system, which was developed in the 1980's and went through major design modifications in the 1990's. This type of safety belt assembly has now been adopted across the industry and may be considered as a standard equipment. There is a lap belt and a shoulder belt in this seat belt assembly. The lap belt was not visible by the observer, but it was possible to record if the commercial motor vehicle driver or passenger was using their shoulder belt. Therefore, the data recorded for safety belt use only refers to the usage of the shoulder belt by the driver or passenger of the commercial motor vehicle.

Commercial motor vehicles subject to Federal Motor Carrier Safety Regulations were included in this survey. The vehicles were categorized into eight groups: auto transporter, gravel train, flatbed trucks with or without cargo, fuel tank truck, dump truck, construction truck, box cargo truck, or garbage truck. The vehicles were identified and categorized depending on ownership (national, regional, local or individual ownership), range (interstate or intrastate), and the type of load transported (hazardous or non-hazardous material). The carrier names were also recorded as stated on the individual commercial motor vehicle's power units. Depending on clarity, the license plate on the rear of the trailer was also recorded.

A 5-minute volume count of commercial motor vehicles was also recorded prior to the observations and after the completion of the observations at all direct observation survey sites. Due to the extremely low volume of commercial motor vehicles, several of the volume counts were zero for the ten minute survey period.

The data observations were manually recorded on survey forms and returned back to the office within 24 hours of the data collection. It is believed that the manual method also increased the accuracy and data verification at the time of data entry.

5.0 DATA ANALYSIS

The data collected in the field was computerized by the office staff and verified for accuracy by the project engineer. Rates for safety belt use were determined for each survey stratum, county, location, etc., as well as the statewide average. In order to analyze and cross-tabulate the data, SPSS, a statistical and data management software package was utilized. Each Commercial vehicle observation was entered into the software and categorized by location, such as stratum and county, commercial vehicle data, such as type of vehicle, and driver and passenger data, such as gender and safety belt use.

The total number of drivers and passengers properly belted was determined as well as the total number of driver and passenger observations. The percentage of safety belt use was calculated by dividing the number of belted observations by the total number of observations for each stratum. The overall weighted safety belt use rate was calculated by summing the product of the stratum safety belt use rate and the stratum weight by the sum of the strata weights.

Each stratum weight was determined by dividing the estimated commercial motor vehicle miles traveled (CMVMT) in the stratum by the highest estimated CMVMT for all the strata. Based upon the CMVMT estimates shown in Table 3, it was found that Stratum 3 had the highest CMVMT and a resulting weight of 1.0. The weight for Stratum 1 was calculated as 0.7825, Stratum 2 was 0.8111, Stratum 4 was 0.4398 and Stratum 5 was 0.0327. The summation of the weights for all the strata equals 3.0661.

The variances for safety belt use for drivers and passengers of commercial vehicles were calculated similar to the variance calculations for the safety belt use for drivers and passengers of passenger vehicles. The variance calculation is based upon Cochran's equation [2], as follows:

$$\text{Variance} = \frac{n}{n-1} \sum_i \left(\frac{g_i}{\sum g_k} \right)^2 (r_i - r)^2$$

In this formula, n represents the number of observation locations, g_i is the number of observations at each location, g_k is the total number of observations within a stratum, r_i is the safety belt use rate for each stratum and r is the overall safety belt use rate. The overall statewide variance was calculated in a similar manner as the overall statewide safety belt use rate. The overall variance was calculated by summing the product of the stratum variance and the squared stratum weight by the squared sum of the strata weights.

The 95 percent confidence bands for each stratum and overall statewide safety belt use were calculated by multiplying 1.96 by the square root of the variance. The standard error for each stratum and statewide safety belt use rate was equal to the square root of the variance. The relative error was calculated by dividing the standard error by the weighted overall safety belt use rate.

The following section provides the results of the data analysis and cross-tabulation.

6.0 RESULTS AND CONCLUSIONS

The observational survey for the commercial motor vehicle statewide sample was performed between Monday, March 6th and Saturday, April 15th of 2006. During this observation period, a total of 2,528 vehicles were observed at 181 observation sites randomly selected to represent statewide safety belt use. The total number of safety belt observations, including drivers and passengers, was 2,644.

The findings for the statewide commercial motor vehicle observational survey, by strata, for driver and passenger safety belt usage are shown in Table 4. The urbanized areas in Strata 1 and 4 produced the two lowest safety belt usage rates, whereas the more rural areas represented in Strata 2, 3 and 5 produced slightly higher safety belt usage rates. Stratum 3 yielded the highest

safety belt usage rate for drivers and passengers of 78.9 percent. The relative errors for each of the strata are listed in Table 4 with Strata 4 and 5 producing errors greater than five percent. However, the relative error is higher in these areas due to the lower total number of observations in these two strata.

Table 4. Safety Belt Use Rate for Commercial Motor Vehicle Drivers and Passengers by Stratum

Stratum	Total No. of Observations	Belted Observations	Unbelted Observations	Safety Belt Use Rate	Relative Error
Stratum 1	719	484	235	$67.3 \pm 4.52\%$	3.13%
Stratum 2	718	535	183	$74.5 \pm 3.71\%$	2.57%
Stratum 3	705	556	149	$78.9 \pm 4.47\%$	3.09%
Stratum 4	408	291	117	$71.3 \pm 7.40\%$	5.13%
Stratum 5	94	69	25	$73.4 \pm 8.32\%$	5.75%

The overall weighted safety belt use rate for drivers and passengers of commercial motor vehicles traveling through the State of Michigan is 73.6 percent with a confidence interval band of 2.36 percent. The relative error for the statewide sample is 1.63 percent, which does not exceed the requirement of five percent, and therefore, meets the precision requirement of the Final Rule for observational surveys. The actual safety belt use rate for drivers and passengers of commercial motor vehicles was 73.2 percent based on a sample size of 2,644 observations.

Tables 5 and 6 summarize the descriptive statistics regarding the observational surveys in terms of day of the week and time of the day. The Final Rule for observational surveys requires that all daylight hours, for all days of the week, should be eligible for inclusion in the final observational sample. These tables represent the actual days of the week and times of the day that were utilized in the statewide sample which were selected through a random selection process.

In terms of day of the week selected for the observational survey, Wednesdays through Fridays were sampled at a higher rate in terms of percent of total observations, than other days, based upon the random selection process. Sundays and Saturdays were the two lowest sampled days in terms of percent of total observations. However, the number of sites selected per day was fairly consistent between Mondays and Saturdays. The number of sites selected for Sundays was slightly lower than the number of sites selected for the remaining days.

Table 5. Statewide Day of the Week Descriptive Statistics

Day of the Week	No. of Sites Observed	Percent of Sites in Day of Week	Total No. of CMV Observed	Percent of Observations in Day of Week
Sunday	16	8.8%	126	5.0%
Monday	22	12.2%	289	11.4%
Tuesday	21	11.6%	306	12.1%
Wednesday	32	17.7%	507	20.1%
Thursday	27	14.9%	512	20.3%
Friday	38	21.0%	588	23.3%
Saturday	25	13.8%	200	7.9%
Total	181	100%	2,528	100%

In terms of the time of day selected for the sample, the hours of the day between 10 AM and 12 PM produced higher number of commercial motor vehicles than other times. These two hours averaged a sample size of 18 commercial motor vehicles per site observed. Applying this rate to the number of sites for the remaining hours of the day, it is seen that the hours between 7 AM and 8 AM, and 2 PM and 6 PM were drastically lower in terms of number of commercial vehicles per site observed. Therefore, the majority of the commercial motor vehicle traffic that was sampled occurred during the four hour period surrounding the lunch hour. This may be due to the sampling process at truck stops, rest areas, truck parking lots and limited access exit and entrance ramps. During the lunch hours, it would be expected that commercial motor vehicle drivers would take a small break.

Table 6. Statewide Time of the Day Descriptive Statistics

Time of the Day	No. of Sites Observed	Percent of Sites in Time of Day	Total No. of CMV Observed	Percent of Observations in Time of Day
7 AM – 8 AM	8	4.4%	85	3.4%
8 AM – 9 AM	15	8.3%	251	9.9%
9 AM – 10 AM	21	11.6%	268	10.6%
10 AM – 11 AM	24	13.3%	419	16.6%
11 AM – 12 PM	21	11.6%	390	15.4%
12 PM – 1 PM	23	12.7%	251	9.9%
1 PM – 2 PM	15	8.3%	275	10.9%
2 PM – 3 PM	15	8.3%	159	6.3%
3 PM – 4 PM	14	7.7%	181	7.2%
4 PM – 5 PM	10	5.5%	101	4.0%
5 PM – 6 PM	9	5.0%	82	3.2%
6 PM – 7 PM	6	3.3%	66	2.6%
Total	181	100%	2,528	100%

The safety belt use rate can be described for the statewide survey by the overall use rate, by stratum, by vehicle type and by various demographics. Table 7 summarizes the overall safety belt use rate for the statewide survey by driver, passenger and total observations. As shown in Table 7, the driver safety belt use rate was found to be 74.1 percent, while the passenger safety belt use rate was found to be 53.4 percent, including drivers and passengers belted properly and improperly. The overall safety belt use rate was 73.2 percent, including drivers and passengers belted. A statistical analysis was performed to determine the correlation between driver safety belt usage and safety belt usage of their passenger. No correlation was found between the driver and passenger rates indicating that passengers chose to utilize their safety belts is independent of driver safety belt use.

Table 7. Statewide Safety Belt Use Summary

Driver Belt Use	Total Observations	Percent of Safety Belt Use
Not Belted	650	25.7%
Belted	1,873	74.1%
Shoulder Belt Under Arm	4	0.2%
Shoulder Belt Behind Back	1	0.0%
Total	2,528	100%
Passenger Belt Use	Total Observations	Percent of Safety Belt Use
No Passenger	2,412	N/A
Not Belted	53	45.7%
Belted	62	53.4%
Shoulder Belt Under Arm	1	0.9%
Shoulder Belt Behind Back	0	0.0%
Total	2,528	100%
Total Belt Use	Total Observations	Percent of Safety Belt Use
Not Belted	703	26.6%
Belted	1,935	73.2%
Shoulder Belt Under Arm	5	0.2%
Shoulder Belt Behind Back	1	0.0%
Total	2,644	100%

Table 8 summarizes the safety belt use rates of commercial motor vehicles by stratum and county for drivers and passengers. In Table 9, the counties are listed by stratum with the percentage of safety belt usage shown for each county, each strata and overall statewide. Because of the relatively low number of sites and/or observations in many counties, the safety belt use rates listed may not fully represent each county. The use rates indicated are the average of the observations taken in each county.

Table 8. Statewide Safety Belt Use Rates by Stratum and County

All Commercial Vehicle Types Safety Belt Use			
Stratum 1	Total No. of Observations	Belted Observations	Percent of Safety Belt Usage
Ingham County	200	123	61.5%
Kalamazoo County	144	107	74.3%
Oakland County	148	109	73.6%
Washtenaw County	229	146	63.8%
Total	721	485	67.3%
Stratum 2	Total No. of Observations	Belted Observations	Percent of Safety Belt Usage
Allegan County	79	61	77.2%
Bay County	19	16	84.2%
Eaton County	73	57	78.1%
Jackson County	156	122	78.2%
Kent County	101	73	72.3%
Livingston County	63	46	73.0%
Macomb County	34	28	82.4%
Midland County	2	2	100%
Ottawa County	189	129	68.3%
Total	716	534	74.7%
Stratum 3	Total No. of Observations	Belted Observations	Percent of Safety Belt Usage
Berrien County	126	93	73.8%
Calhoun County	133	113	85.0%
Clinton County	17	15	88.2%
Genesee County	114	88	77.2%
Ionia County	23	19	82.6%
Lapeer County	51	47	92.2%
Lenawee County	11	8	72.7%
Monroe County	35	18	51.4%
Muskegon County	35	23	65.7%
Saginaw County	26	22	84.6%
Shiawassee County	32	31	96.9%
St. Clair County	68	51	75.0%
St. Joseph County	16	15	93.8%
Van Buren County	18	13	72.2%
Total	705	556	78.9%
Stratum 4	Total No. of Observations	Belted Observations	Percent of Safety Belt Usage
Wayne County	408	291	71.3%
Stratum 5	Total No. of Observations	Belted Observations	Percent of Safety Belt Usage
Delta County	13	9	69.2%
Mackinac County	47	32	68.1%
Schoolcraft County	34	28	82.4%
Total	94	69	73.4%
Grand Strata Total	2,644	1,935	73.2%

Table 9 summarizes driver and passenger safety belt use by survey day, time, gender, age and race for the statewide commercial motor vehicle survey. Drivers and passengers of commercial motor vehicles have lower safety belt usage rates on Sundays, Mondays and Saturdays as opposed to other days of the week. Safety belt usage rates are lowest during the hours of 7 AM and 8 AM, 9 AM and 10 AM, 3 PM and 4 PM, and 5 PM and 6 PM. Safety belt usage rates are highest immediately following the lunch hour between the hour of 1 PM and 2 PM. The remaining hours of the day average safety belt usage rate for drivers and passenger is approximately 75 percent. Gender does not seem to impact the choice of the driver or passenger to utilize their safety belt, as the safety belt usage rates for males and females only differs by 1.5 percent. However, the vast majority of commercial motor vehicle drivers and passengers are male representing over 97 percent of the driver and passenger population. As age increases, the tendency for drivers and passengers to utilize their safety belts increases from 71.8 percent for ages under 29 to 74.1 percent for drivers and passengers over the age of 60. Nearly 82 percent of the drivers and passengers of commercial motor vehicles are between the ages of 30 and 59 based upon the observational sample. Although the rates for drivers and passengers of races other than Caucasian vary slightly than those of the Caucasian race, the observations only account for only ten percent of the population. Eighty-nine (89) percent of the drivers and passengers of commercial motor vehicles are Caucasian and utilize their safety belts at a rate of 73.1 percent.

Table 9. All Commercial Vehicles Statewide Safety Belt Usage Summary

All Commercial Vehicle Types Safety Belt Use			
Day of the Week	Total No. of Observations	Belted Observations	Percent of Safety Belt Usage
Sunday	136	86	63.2%
Monday	301	208	69.1%
Tuesday	315	248	78.7%
Wednesday	523	385	73.6%
Thursday	527	397	75.3%
Friday	617	453	73.4%
Saturday	225	158	70.2%
Total	2,644	1,935	73.2%

Table 9. All Commercial Vehicles Statewide Safety Belt Usage Summary (Continued)

Time of Day	Total No. of Observations	Belted Observations	Percent of Safety Belt Usage
7 AM – 8 AM	87	58	66.7%
8 AM – 9 AM	259	203	78.4%
9 AM – 10 AM	277	181	65.3%
10 AM – 11 AM	436	332	76.1%
11 AM – 12 PM	407	299	73.5%
12 PM – 1 PM	265	189	71.3%
1 PM – 2 PM	285	228	80.0%
2 PM – 3 PM	169	126	74.6%
3 PM – 4 PM	190	129	67.9%
4 PM – 5 PM	108	84	77.8%
5 PM – 6 PM	90	54	60.0%
6 PM – 7 PM	71	52	73.2%
Total	2,644	1,935	73.2%
Gender	Total No. of Observations	Belted Observations	Percent of Safety Belt Usage
Male	2,569	1,881	73.2%
Female	75	54	72.0%
Total	2,644	1,935	73.2%
Age	Total No. of Observations	Belted Observations	Percent of Safety Belt Usage
Under 29	255	180	70.6%
30-59	2,161	1,586	73.4%
60+	228	169	74.1%
Total	2,644	1,935	73.2%
Race	Total No. of Observations	Belted Observations	Percent of Safety Belt Usage
Caucasian	2,364	1,723	72.9%
African American	215	165	76.7%
Asian or Pacific Islander	27	22	81.5%
Hispanic	38	25	65.8%
Native American	0	0	0.0%
Total	2,644	1,935	73.2%

Table 10 summarizes the license plates of the commercial motor vehicles sampled with the safety belt survey. In general, commercial motor vehicles that are not licensed in the state, traveling through the State of Michigan, tend to utilize their safety belts at a higher rate than those licensed in the State of Michigan. The number of commercial vehicles sampled from the State of Michigan was nearly 64 percent. Maine was the second most represented state in commercial motor vehicle observations with slightly more than six percent of the observations. Four provinces of Canada were represented in the sample including Ontario, Quebec, Manitoba,

and Alberta, with only Ontario and Quebec having greater than ten commercial motor vehicle observations.

Table 10. All Commercial Vehicles Statewide Safety Belt Usage by State

All Commercial Vehicle Types Safety Belt Use			
State or Province	Total No. of Observations	Belted Observations	Percent of Safety Belt Usage
Michigan	1,690	1,213	71.8%
Maine	171	131	76.6%
Indiana	136	103	75.7%
Ontario	112	82	73.2%
Tennessee	104	80	76.9%
Illinois	88	66	75.0%
Wisconsin	65	49	75.4%
Ohio	64	49	76.6%
Iowa	18	14	77.8%
Quebec	15	14	93.3%
Missouri	15	12	80.0%
Oklahoma	13	10	76.9%
Minnesota	13	9	69.2%
Pennsylvania	12	10	83.3%
Remaining States*	68	49	72.1%
Illegible Plates	60	44	73.3%
Total	2,644	1,935	73.2%

*States with less than ten total safety belt observations

Figure 2 depicts the safety belt usage rates for the various types of commercial vehicles observed in the survey including auto transporter, gravel train, flatbed truck, fuel tanker, dump truck, construction truck, box cargo truck and garbage truck. The drivers and passengers of dump trucks and construction trucks have the lowest safety belt usage rate which is near 50 percent. This may be due to the operation of these types of vehicles where the driver of the truck is not consistently in the vehicle during the work day. However, the observational data indicates that the drivers also do not utilize their safety belts while driving between work locations. The box cargo truck was the most represented type of commercial motor vehicle in the observational survey with nearly 70 percent of the vehicles observed. The safety belt usage rate for box cargo trucks was the highest of all the various commercial motor vehicle types at 75.5 percent. The gravel trains had the second highest safety belt usage rate of 74.1 percent and represented

slightly more than 4 percent of all vehicles. The remaining vehicle types averaged a safety belt usage rate of approximately 70 percent. The flatbed trucks were the highest represented category of these vehicles with nearly 13 percent of the vehicle population surveyed.

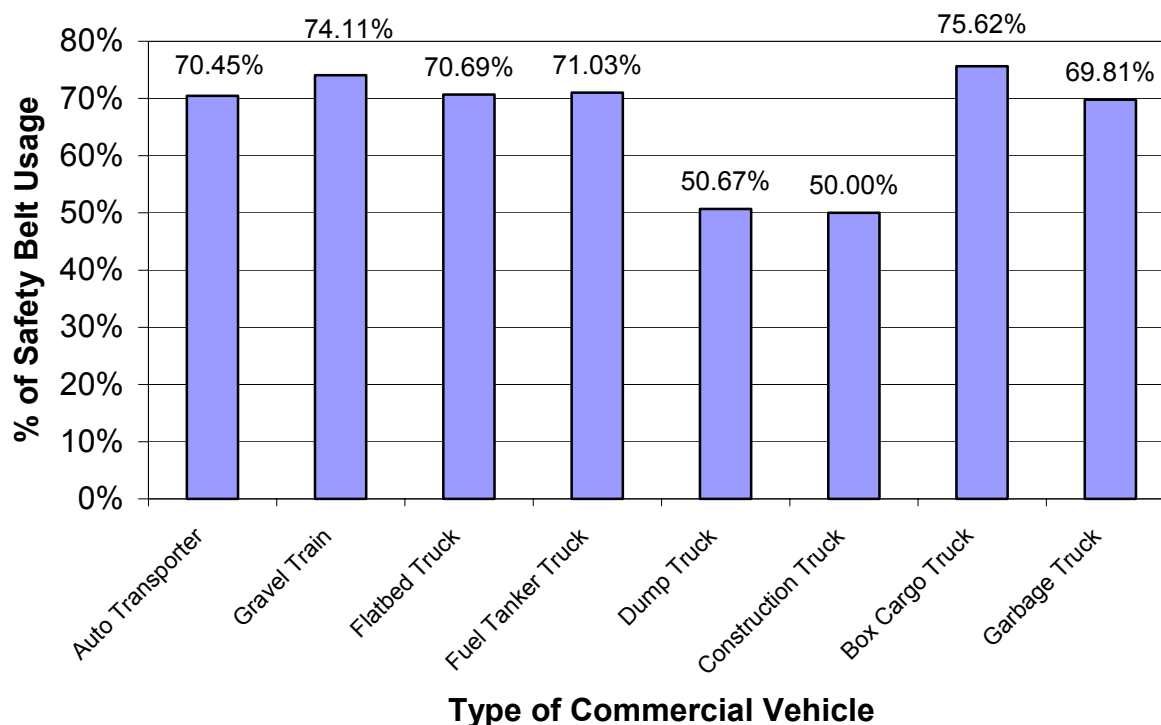


Figure 2. Type of Commercial Motor Vehicles Statewide Safety Belt Usage

Figure 3 depicts the safety belt usage rate based on the type of ownership of commercial vehicles, range of commercial motor vehicles, and the type of cargo hauled. The individually owned commercial vehicles recorded the highest safety belt usage rates of nearly 76 percent; however, they only represented ten percent of the commercial vehicles observed. The national and regional fleets had similar safety belt usage rates of approximately 74 percent. The national fleet represented approximately 44 percent of all the commercial vehicles observed in the statewide sample; whereas, the regional fleet only represented 19 percent. The local fleets had the lowest safety belt usage rate of less than 70 percent and represented nearly 27 percent of all commercial vehicles observed in the survey.

The range, interstate and intrastate, for commercial vehicles was based upon the carrier licensing numbers located on the power train of the commercial vehicle. Based upon the observational survey, the commercial motor vehicles licensed for interstate travel had much higher safety belt usage rates than their intrastate counterparts. The licensed interstate commercial vehicles represented more than 81 percent of all vehicles surveyed and had a safety belt usage rate of 74.8 percent. The commercial vehicles licensed for travel in the State of Michigan only recorded a safety belt usage rate of 66.3 percent.

Drivers and passengers hauling non-hazardous cargo in their commercial motor vehicle had a higher safety belt usage rate of nearly 74 percent, while those hauling hazardous materials had a much lower rate of nearly 69 percent. Of all the commercial motor vehicles surveyed, 95 percent of the vehicles were hauling non-hazardous materials.

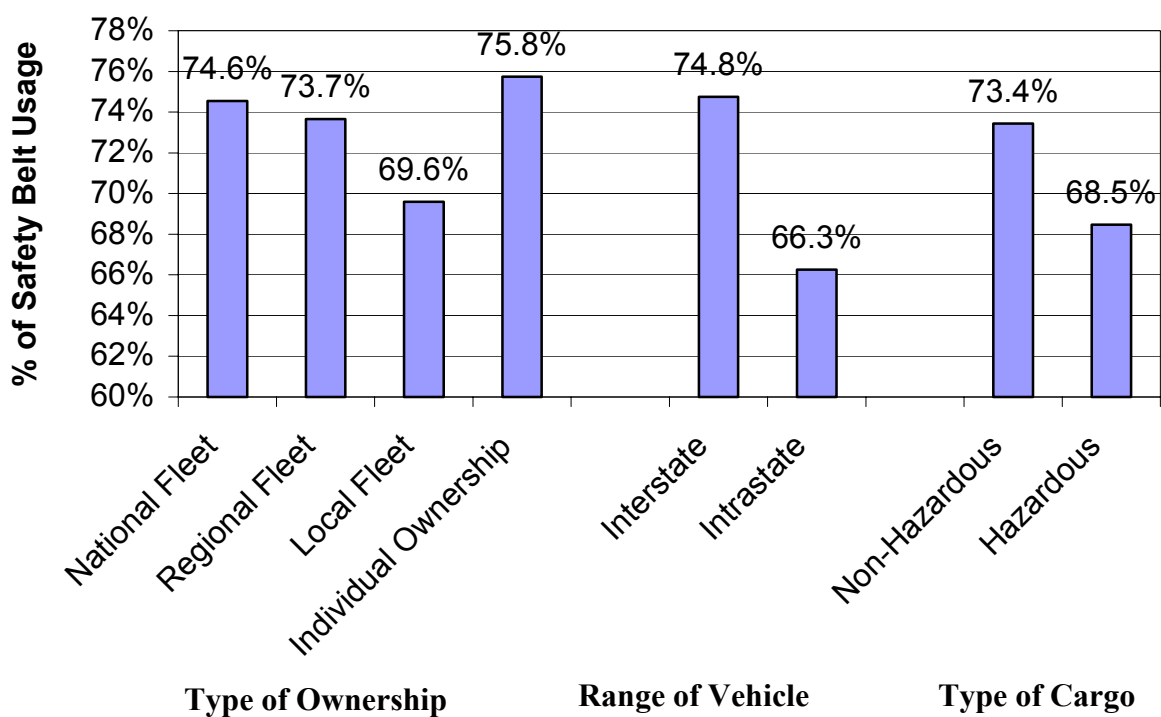


Figure 3. Commercial Motor Vehicles Statewide Safety Belt Usage by Ownership, Range and Cargo

Overall, the drivers and passengers observed in the Stratum 3 counties have the highest safety belt use rates followed by Stratum 2 and Stratum 5. The counties in these three strata are considered more rural in nature than Stratum 4 representing Wayne County and Stratum 1 representing Ingham, Kalamazoo, Oakland and Washtenaw Counties. Drivers traveling during the week on Tuesdays through Fridays have higher safety belt use rates as do those traveling between 1 PM and 2 PM, 10 AM and 11 AM, 2 PM and 3 PM, 4 PM and 5 PM and 6 PM and 7 PM.

Males and females tend to utilize their safety belts at similar usage rates, although the frequency of female commercial vehicle drivers and passengers is very low. In terms of age, older drivers and passengers tend to utilize their safety belts at higher rates than their younger counterparts. Drivers or passengers of the Asian or Pacific Islander race utilized their safety belts at higher rate than any other ethnicity, while Hispanics utilized their safety belts at rates lower than the average use rates. The vast majority of commercial vehicle drivers are males between the ages of 30 and 59 and those belonging to the Caucasian race.

The number of commercial motor vehicles traveling in the State of Michigan were vehicles licensed in Michigan. Thirty-six (36) states and four Canadian Provinces were represented in the observational survey. The safety belt usage rate was highest for those vehicles not licensed in the State of Michigan, with the exception of Minnesota, which had a slightly lower rate than that found for commercial vehicles licensed in the State of Michigan.

The most represented type of vehicle was the box cargo truck. The drivers and passengers of box cargo trucks recorded the highest safety belt usage rate. Commercial motor vehicles licensed for interstate travel also recorded the highest safety belt usage rates. With the exception of local fleets, the safety belt usage rates for type of ownership of commercial motor vehicles were similar. The local fleets recorded a safety belt usage rate of less than 70 percent. In terms of type of cargo, those drivers and passengers of non-hazardous materials chose to utilize their safety belts at a much higher rate than those transporting hazardous materials.

In November of 2003, the Federal Motor Carrier Safety Administration (FMCSA) conducted a commercial motor vehicle safety belt observational survey of twelve states with a total of 117 observational sites. A total of 3,909 commercial motor vehicles were observed with an overall safety belt usage rate of 48 percent. For that same year of 2003, the national usage rate for all passenger vehicles was at 79 percent. The state with the highest safety belt usage rate for commercial motor vehicles was Washington with a rate of 58 percent.

Based on national averages, the State of Michigan has exceeded the national average, in addition to having the highest state usage rate with a weighted usage rate of 73.9 percent. With the current success rate of commercial motor vehicle safety belt usage rates, future programs focusing on commercial motor vehicle safety belt usage should be successful based upon the success of passenger vehicle campaigns to increase safety belt usage rates. Based on the results of the observational data, future programs should be targeted to local fleets, all commercial vehicles licensed in the State of Michigan, and vehicles associated with construction, such as dump and construction trucks.

REFERENCES

1. "Safety Belt Usage by Commercial Motor Vehicle Drivers Final Report," Federal Motor Carrier Safety Administration, November 2003.
2. Cochran, W.W., (1977). *Sampling Techniques, 3rd Edition*. New York, New York. Wiley Publishing.

APPENDIX I – LIST OF OBSERVATION LOCATIONS

Location Number	Strata	County	Location	Type of Location	Included in Safety Belt Usage Rate Calculation?
1	1	Ingham	I-96 Exit 122	Truck Parking	Yes
2	1	Ingham	Nada's Mobil on I-96 Exit 122 (Webberville)	Truck Stop	Yes
3	1	Ingham	Windmill Truck Stop on I-96 Exit 098-A (Diamonddale)	Truck Stop	Yes
4	1	Ingham	Lansing Rest Area on US-127 NB	Rest Area	Yes
5	1	Ingham	Okemos Rest Area on I-96 EB	Rest Area	Yes
6	1	Ingham	I-496 and Dunkel	Exit Ramp	Yes
7	1	Ingham	Cedar and US-127	Exit Ramp	Yes
8	1	Ingham	US-127 and Saginaw	Exit Ramp	Yes
9	1	Ingham	US-127 and Leslie	Exit Ramp	Yes
10	1	Ingham	Abbott and Linden	Signalized Intersection	Yes
11	1	Ingham	Marsh and Pike	Signalized Intersection	Yes
12	1	Ingham	Abbott and Saginaw	Signalized Intersection	Yes
13	1	Ingham	Okemos and Jolly	Signalized Intersection	Yes
14	1	Kalamazoo	I-94 Exit 72A	Truck Parking	Yes
15	1	Kalamazoo	Citgo Raceway on 5500 W. D Ave (Kalamazoo)	Truck Stop	Yes
16	1	Kalamazoo	Galesburg Rest Area on I-94 WB	Rest Area	Yes
17	1	Kalamazoo	Alamo Rest Area on US-131 SB	Rest Area	Yes
18	1	Kalamazoo	US-131, Exit 31	Exit Ramp	Yes
19	1	Kalamazoo	W Main and Drake	Signalized Intersection	Yes
20	1	Kalamazoo	Michigan and Harrison	Signalized Intersection	Yes
21	1	Kalamazoo	Kalamazoo and Park	Signalized Intersection	Yes
22	1	Kalamazoo	Portage and South	Signalized Intersection	No
23	1	Oakland	I-96 Exit 159 - Wixom Road	Truck Parking	Yes
24	1	Oakland	Clarkston Rest Area on I-75 SB	Rest Area	Yes
25	1	Oakland	Davisburg Rest Area on I-75 NB	Rest Area	Yes
26	1	Oakland	I-696 and Orchard Lake	Exit Ramp	Yes
27	1	Oakland	M-10 and 8 Mile	Exit Ramp	Yes
28	1	Oakland	I-696 and Woodward	Exit Ramp	Yes
29	1	Oakland	I-75 and Baldwin	Exit Ramp	Yes
30	1	Oakland	Pontiac Trail and 9 Mile	Signalized Intersection	Yes
31	1	Oakland	Dixie Hwy and Williams Lake	Signalized Intersection	Yes
32	1	Oakland	Woodward and 9 Mile	Signalized Intersection	Yes
33	1	Oakland	Telegraph and 14 Mile	Signalized Intersection	Yes
34	1	Oakland	Telegraph and Franklin	Signalized Intersection	Yes
35	1	Oakland	Highland and Williams Lake	Signalized Intersection	Yes
36	1	Washtenaw	I-94 Exit 145	Truck Parking	Yes
37	1	Washtenaw	I-94 Exit 167	Truck Parking	Yes
38	1	Washtenaw	US 23 Exit 24	Truck Parking	No
39	1	Washtenaw	US 23 Exit 49	Truck Parking	Yes
40	1	Washtenaw	US 23 Exit 50	Truck Parking	Yes
41	1	Washtenaw	Pilot Travel Center #021 on 750 Baker Road (Dexter)	Truck Stop	No
42	1	Washtenaw	Pilot Travel Center #296 on 195 Baker Road (Dexter)	Truck Stop	No
43	1	Washtenaw	Ann Arbor Rest Area on I-94 EB	Rest Area	Yes
44	1	Washtenaw	Northfield Church Rest Area on US-23 SB	Rest Area	Yes
45	1	Washtenaw	I-94 and Jackson	Exit Ramp	Yes
46	1	Washtenaw	I-94 and Huron/Whitaker	Exit Ramp	Yes
47	1	Washtenaw	I-94 and State	Exit Ramp	Yes
48	1	Washtenaw	M-14 and Maple	Exit Ramp	Yes
49	1	Washtenaw	US-23 and Michigan Avenue	Exit Ramp	Yes
50	1	Washtenaw	Michigan and Monroe	Signalized Intersection	Yes

Location Number	Strata	County	Location	Type of Location	Included in Safety Belt Usage Rate Calculation?
1	2	Allegan	US-131 and 142nd	Truck Stop	Yes
2	2	Allegan	Saugatuck Rest Area on I-196 SB	Rest Area	Yes
3	2	Allegan	US-131 and 135th	Exit Ramp	Yes
4	2	Allegan	US-131 and M-89	Exit Ramp	Yes
5	2	Bay	I-75 Exit 181	Truck Parking	Yes
6	2	Bay	I-75 and Pinconning Road	Exit Ramp	Yes
7	2	Bay	Wilder and 2 Mile	Signalized Intersection	No
8	2	Eaton	I-69 Exit 70	Truck Parking	Yes
9	2	Eaton	I-96 Exit 98A	Truck Parking	Yes
10	2	Eaton	Pottsville Rest Area on I-69 NB	Rest Area	Yes
11	2	Eaton	I-69/96 and M-43	Exit Ramp	Yes
12	2	Eaton	M-43 and Creyts	Signalized Intersection	Yes
13	2	Jackson	I-94 Exit 130	Truck Parking	Yes
14	2	Jackson	I-94 Exit 145	Truck Parking	Yes
15	2	Jackson	Buddy's on 107 E. Main St (Parma)	Truck Stop	Yes
16	2	Jackson	Michigan and Sutton	Signalized Intersection	Yes
17	2	Jackson	Grass Lake Rest Area on I-94 WB	Rest Area	Yes
18	2	Jackson	Sandstone Rest Area on I-94 EB	Rest Area	Yes
19	2	Jackson	Jackson Rest Area on US-127 SB	Rest Area	Yes
20	2	Jackson	US-127 and Michigan	Exit Ramp	Yes
21	2	Jackson	US-127 and Page	Exit Ramp	Yes
22	2	Kent	I-196 Exit 49	Truck Parking	Yes
23	2	Kent	US-131 and 10 Mile	Exit Ramp	Yes
24	2	Kent	US-131 and 84th Street	Exit Ramp	Yes
25	2	Kent	US-131 and 68th	Exit Ramp	Yes
26	2	Kent	52nd and Broadmoor	Signalized Intersection	Yes
27	2	Kent	Collindale and Lake Michigan	Signalized Intersection	Yes
28	2	Kent	Patterson and 52nd	Signalized Intersection	Yes
29	2	Kent	Alpine and Alpenhorn	Signalized Intersection	Yes
30	2	Kent	68th and Broadmoor	Signalized Intersection	Yes
31	2	Livingston	I-96 Exit 129	Truck Parking	Yes
32	2	Livingston	I-96 Exit 148B	Truck Parking	No
33	2	Livingston	Howell Rest Area on I-96 EB	Rest Area	No
34	2	Livingston	Lake Chemung Rest Area on I-96 WB	Rest Area	Yes
35	2	Livingston	I-96 and Kensington	Exit Ramp	Yes
36	2	Livingston	US-23 and Clyde	Exit Ramp	Yes
37	2	Macomb	I-696 and Groesbeck	Exit Ramp	Yes
38	2	Midland	Swede and Wheeler	Signalized Intersection	Yes
39	2	Ottawa	I-196 Exit 18	Truck Parking	Yes
40	2	Ottawa	I-96 Exit 26 BP	Truck Stop	Yes
41	2	Ottawa	Speedway at I-196 EB	Truck Stop	Yes
42	2	Ottawa	Tulip City Truck Stop on I-196 Exit 049 (Holland)	Truck Stop	Yes
43	2	Ottawa	Fruitport Rest Area on I-96 WB	Rest Area	Yes
44	2	Ottawa	Zeeland Rest Area on I-196 NB	Rest Area	Yes
45	2	Ottawa	US-31 and Ferris	Signalized Intersection	Yes
46	2	Ottawa	US-31 and Lake Michigan	Signalized Intersection	Yes
47	2	Ottawa	Taylor and US-31	Signalized Intersection	Yes
48	2	Ottawa	US-31 and 16th	Signalized Intersection	Yes
49	2	Ottawa	Michigan and West	Signalized Intersection	Yes
50	2	Ottawa	Highland and 32nd	Signalized Intersection	Yes
51	2	Ottawa	Lake Michigan and Campus	Signalized Intersection	Yes

Location Number	Strata	County	Location	Type of Location	Included in Safety Belt Usage Rate Calculation?
1	3	Berrien	I-94 Exit 12A	Truck Parking	Yes
2	3	Berrien	I-94 Exit 29	Truck Parking	Yes
3	3	Berrien	I-94 Exit 30	Truck Parking	Yes
4	3	Berrien	Pilot Travel Center #019 on 10300 Red Arrow Highway (Bridgeman)	Truck Stop	Yes
5	3	Berrien	Dunes ATP on I-94 Exit 012 (Sawyer)	Truck Stop	Yes
6	3	Berrien	I-94 and Lakeside/Union	Exit Ramp	Yes
7	3	Berrien	New Buffalo Plaza	Truck Parking	Yes
8	3	Berrien	Red Arrow Hwy and Glenlord	Signalized Intersection	Yes
9	3	Calhoun	I-94 Exit 104	Truck Parking	Yes
10	3	Calhoun	I-94 Exit 115A	Truck Parking	Yes
11	3	Calhoun	I-94 Battle Creek Rest Area	Truck Parking	Yes
12	3	Calhoun	I-69 Exit 25	Truck Parking	Yes
13	3	Calhoun	Pilot Travel Center #017 on 15901 Eleven Mile Road (Battle Creek)	Truck Stop	Yes
14	3	Calhoun	TE-KHI Truck Auto Plaza on 15874 Eleven Mile Road (Battle Creek)	Truck Stop	Yes
15	3	Calhoun	I-94 and Beadle Lake	Exit Ramp	Yes
16	3	Calhoun	I-94 and M-66	Exit Ramp	Yes
17	3	Calhoun	Bedford and Michigan	Signalized Intersection	Yes
18	3	Calhoun	Michigan and 15 Mile	Signalized Intersection	Yes
19	3	Calhoun	B and Homer	Signalized Intersection	No
20	3	Calhoun	Columbia and Riverside	Signalized Intersection	Yes
21	3	Calhoun	Michigan and West	Signalized Intersection	Yes
22	3	Clinton	Grand Ledge Rest Area on I-96 EB	Rest Area	Yes
23	3	Genesee	BP Quick Save #7 on I-75 Exit 126 (Mt. Morris)	Truck Stop	Yes
24	3	Genesee	Fenton Rest Area on US-23 NB	Rest Area	Yes
25	3	Genesee	Dodge Road Rest Area on I-75 NB	Rest Area	Yes
26	3	Genesee	I-75 and Mt. Morris	Exit Ramp	Yes
27	3	Genesee	I-475 and Court	Exit Ramp	Yes
28	3	Genesee	Leith and Dort	Signalized Intersection	Yes
29	3	Genesee	Court and Saginaw	Signalized Intersection	Yes
30	3	Genesee	Linden and Corunna	Signalized Intersection	Yes
31	3	Genesee	Fenton and 12th	Signalized Intersection	Yes
32	3	Genesee	Atherton and Dort	Signalized Intersection	Yes
33	3	Ionia	I-96 Exit 77	Truck Parking	Yes
34	3	Ionia	Speedway #2319 on I-96 Exit 077 (Portland)	Truck Stop	No
35	3	Ionia	Portland Rest Area on I-96	Rest Area	Yes
36	3	Lapeer	Speedway #8772 on I-69 Exit 168 (Imlay City)	Truck Stop	Yes
37	3	Lapeer	Five Lakes Rest Area on I-69 EB	Rest Area	Yes
38	3	Lenawee	Dundee Welcome Center on US-23 NB	Rest Area	Yes
39	3	Monroe	I-75 Exit 13	Truck Parking	Yes
40	3	Monroe	Carleton Rest Area on I-275 SB	Rest Area	Yes
41	3	Monroe	US-23 and Exit 13	Exit Ramp	Yes
42	3	Monroe	US-23 and Plank	Exit Ramp	No
43	3	Monroe	US-24 and Mall	Signalized Intersection	No
44	3	Monroe	Telegraph and Samaria	Signalized Intersection	No
45	3	Muskegon	US-31 and 24th	Signalized Intersection	Yes
46	3	Muskegon	Roberts and Laketon	Signalized Intersection	Yes
47	3	Saginaw	I-75 Exit 136	Truck Parking	Yes
48	3	Saginaw	M-81 Sunoco on I-75 Exit 151 (Saginaw)	Truck Stop	Yes
49	3	Saginaw	Woodbridge and Court	Signalized Intersection	No
50	3	Saginaw	Bay and Vogue	Signalized Intersection	Yes
51	3	Saginaw	Center and Shattuck	Signalized Intersection	No
52	3	St. Clair	I-69 Exit 196	Truck Parking	Yes
53	3	St. Clair	Express Food Depot #008 on I-69 Exit 176 (Capac)	Truck Stop	Yes
54	3	St. Clair	Richmond Rest Area on I-94 WB	Rest Area	Yes
55	3	St. Clair	Capac Rest Area on I-69 WB	Rest Area	Yes
56	3	St. Clair	I-69 and Riley Center	Exit Ramp	No
57	3	St. Joseph	US-131 and Gleason	Exit Ramp	No
58	3	Shiawassee	Exit 76 Auto Truck Plaza on 460 76 th St. (Byron City)	Truck Stop	Yes
59	3	Shiawassee	Sunoco on 3034 Lansing Rd. (Perry)	Truck Stop	No
60	3	Shiawassee	Woodbury Rest Area on I-69 WB	Rest Area	Yes
61	3	Shiawassee	I-69 and M-52	Exit Ramp	Yes
62	3	Van Buren	Watervliet Rest Area on I-94 WB	Rest Area	Yes
63	3	Van Buren	I-196 and Phoenix	Exit Ramp	Yes

Location Number	Strata	County	Location	Type of Location	Included in Safety Belt Usage Rate Calculation?
1	4	Wayne	8 Mile & Greenfield	Signalized Intersection	Yes
2	4	Wayne	Belleville Rest Area on I-94 WB	Rest Area	No
3	4	Wayne	Chapps Landing	Truck Stop	Yes
4	4	Wayne	Ecorse & Inkster	Signalized Intersection	Yes
5	4	Wayne	Eureka & Telegraph	Signalized Intersection	Yes
6	4	Wayne	Farmington and Plymouth	Signalized Intersection	Yes
7	4	Wayne	Grand River & 8 Mile	Signalized Intersection	Yes
8	4	Wayne	I-275 & Ford	Truck Parking	Yes
9	4	Wayne	I-275 Exit 11 Lot	Truck Parking	Yes
10	4	Wayne	I-275 Exit 20 Lot	Truck Parking	Yes
11	4	Wayne	I-75 & Northline	Exit Ramp	Yes
12	4	Wayne	I-75 & Southfield	Exit Ramp	Yes
13	4	Wayne	I-94 & Harper	Exit Ramp	No
14	4	Wayne	I-94 & Telegraph	Truck Parking	Yes
15	4	Wayne	I-96 & Grand River	Exit Ramp	Yes
16	4	Wayne	I-96 & Livernois	Exit Ramp	No
17	4	Wayne	I-96 & Middlebelt	Exit Ramp	Yes
18	4	Wayne	M-10 & Grand Blvd	Exit Ramp	Yes
19	4	Wayne	M-10 & Jefferson	Exit Ramp	Yes
20	4	Wayne	M-39 and Oakwood Blvd	Exit Ramp	Yes
21	4	Wayne	M-39 and Southfield	Exit Ramp	No
22	4	Wayne	Middlebelt & Eureka	Signalized Intersection	Yes
23	4	Wayne	Mobil Truck Plaza on I-275 Exit	Truck Stop	Yes
24	4	Wayne	Telegraph & Northline	Signalized Intersection	Yes
25	4	Wayne	Truck City on Wyoming Avenue	Truck Stop	Yes
26	4	Wayne	Van Dyke & 7 Mile	Signalized Intersection	Yes
27	4	Wayne	Westland Rest Area on I-275 NB	Rest Area	Yes
28	4	Wayne	Woodward & Warren	Signalized Intersection	Yes

Location Number	Strata	County	Location	Type of Location	Included in Safety Belt Usage Rate Calculation?
1	5	Delta	M-35 and US-2	Signalized Intersection	Yes
2	5	Mackinac	Naubinway Rest Area on US-2 EB/WB	Rest Area	Yes
3	5	Mackinac	St. Ignace Welcome Center on I-75 NB	Rest Area	Yes
4	5	Mackinac	I-75 and US-2	Exit Ramp	Yes
5	5	Mackinac	I-75 and Exit 348	Exit Ramp	Yes
6	5	Mackinac	I-75 and M-123, Exit 352	Exit Ramp	Yes
7	5	Mackinac	I-75 and Exit 359, M-134	Exit Ramp	Yes
8	5	Schoolcraft	Seney Rest Area on M-28 EB/WB	Rest Area	Yes
9	5	Schoolcraft	US-2 and US-41	Signalized Intersection	Yes
10	5	Schoolcraft	M-94 and US-2	Signalized Intersection	Yes